HAGERSTOWN COMMUNITY COLLEGE
Hagerstown, MD
MASTER SYLLABUS

COURSE: MAT 205 Calculus III (4 credits)
INSTRUCTOR: Christopher Lewis,
SEMESTER: 2017-2018

COURSE DESCRIPTION: The study of differentiation and integration applied to multivariable functions and vector functions. Topics include: vectors and the geometry of space, partial derivatives, directional derivatives and the gradient vector, multiple integrals, integration with cylindrical and spherical coordinates, and vector calculus.
Prerequisite: MAT 204.

TEXTBOOK: Calculus, Early Transcendentals by James Stewart 7th edition, Thomson Learning, Inc. ISBN 9780538497909 or Eighth Edition ISBN 9781285741550

STUDENT LEARNING OUTCOMES:
In this course students will acquire:

1) **TECHNICAL COMPETENCY** in the methods of calculus that will enable them to find limits, derivatives and integrals of vector-valued and multi-variable functions and to recognize the setting in which the result applies. *(Supports Mathematics Program Outcomes 1 and 5)*

2) **CONCEPTUAL UNDERSTANDING** of limits, continuity, differentiation and integration and the theorems that relate these topics.as applied to vector-valued and multi-variable functions. Conceptual understanding will be developed by requiring students to view and understand these topics and their related theorems from numeric, geometric, algebraic and written/verbal perspectives. **(The Rule of Four).** *(Supports Mathematics Program Outcomes 1, 2, 4 5, 6 and 7)*

3) **UTILITY** in the methods of calculus. Students will use calculus to solve applied problems from a variety of disciplines ranging from biology, economics, business, engineering, and the social sciences, but primarily focusing on applications from physics and mathematics. (Ou*tcomes 1, 2, 4, 5, 6 and 7)*

***Graphing calculators and TEC will help support student learning outcomes.**

General Education Outcomes:
Upon successful completion of this course students will be able to:
1. Apply mathematical methods involving arithmetic, algebra, geometry, and graphs to solve problems.
2. Represent mathematical information and communicate mathematical reasoning symbolically and verbally.
3. Interpret and analyze numerical data, mathematical concepts, and identify patterns to formulate and validate reasoning

COURSE CONTENT OBJECTIVES:
This course is an extension of the development of topics within Calculus I & II to include 3-dimensional surfaces and their vector representations. Vector-valued position ,velocity, and acceleration vectors are employed to describe arc length and curvature in 3-space. Multiple integration of scalar functions in multiple variables and multiple coordinate systems, as well as vector analysis leading to classic results of physical mechanics conclude this course, and the calculus sequence.

A principal objective of the course is to solidify the student's appreciation of the underlying thoughts and historical development of the calculus, as well as a solid understanding of the power of its techniques. This course enlarges foundations in differentiation and integration, coupled with their associated application in 3-dimensional space using vector-valued functions and multiple integration in rectangular, polar, cylindrical, and spherical coordinate systems.

- Develop the concept of parameterized curves where two- or three-dimensional position is dependent upon some other variable (usually time). Investigate techniques to simplify tangent line and arc length calculations for parameterized curves.
- Develop the concept of vectors in 3-space from the intuitive as well as algebraic sense. Define properties of relationships between vectors to include scalar and vector products. Define lines and planes in space. Strengthen the student's intuitive appreciation of resulting vector operations as substantiated by associated algebraic computations.
- Be exposed to vector-valued functions using algebraic and transcendental functions derived in the preceding calculus sequence. Differentiation and integration of vector-valued functions leading to velocity, and acceleration vectors will be developed together with their tangential and orthogonal properties. Applications to arc length and surface area will exploit the properties of parametric representations.
- Utilize Increments and Differentials to develop iterated solutions to numerical analysis problems.
- Extend earlier techniques of integration and differentiation of scalar functions to the field of vector-valued functions. Partial differentiation will be introduced to permit development of directional derivatives and the concept of the gradient function. With these capabilities, the student will broaden concepts of extrema for functions of more than one variable, undertake double and triple integrals, considerations for centers of mass, surface area, and associated applications. Introduction to independence of path for line integrals within conservative vector fields will conclude this course by exposing the student to classic results in the physical mechanics including Green's, Stoke's and the Divergence Theorem.
- The content objectives will by demonstrated by
    - Employing vector operations and properties to include additive, scalar, and vector cross product operations. Using such fundamental properties, the student will provide evidence of employing vectors to define lines and planes in 3-space, and will demonstrate competence in extending such capability to conic surfaces.
    - Showing ability to define vector-valued functions in terms of the scalar functions as components to the basis vectors. Interpreting resulting-properties correctly. Successfully differentiating and integrating the scalar components.
    - Providing evidence of understanding and competence in differentiation and integration of functions of more than one variable. Choosing appropriate coordinate system to enable integration.
    - Demonstrating capability with partial derivatives so as to permit derivations of directional derivatives and gradient functions.
    - Utilizing Newton's Method with partial derivatives to compute multi-dimensional solutions to numerical analysis problems.

ASSESSMENT: Grading for this course is planned to consist mainly of examinations with possible announced quizzes and graded homework. There is also a final examination. The grade will be determined by dividing the total points accumulated by the total points possible.

A = 90% - 100%
B = 80% - 89%
C = 70% - 79%
D = 60% - 69%
F = 0% - 59%

The above percentages are used as a guideline in determining grades. For example, a cumulative average of 78%, with improved work, may result in a final grade of B. On the other hand, if test scores have deteriorated since the beginning of the semester, a cumulative average of 78% will be interpreted as a final grade of C.

All students are expected to complete assignments on time and to come to each class prepared to ask questions and cover new material. Any academic dishonesty will result in 0 points for the quiz, exam or assignment involved and will, quite possibly, result in a grade of F for the course. Excessive absences (more than 3 classes missed) may result in a lowered grade. Any student more than 50% of the time will fail the course.

Do not miss any exams. Students absent from an announced test or quiz may be given an equivalent exam at a later date **or a zero** at the discretion of the instructor. Make-up exams will be more difficult than in-class exams and will only be given immediately following the final exam.

COURSE POLICIES:

Hagerstown Community College's Attendance Policy: Students are expected to attend all classes. In the case of absence due to emergency, or participation in Official College functions, it is the student's responsibility to confer with the instructor about the absence and missed course work.

Further, it is the student's responsibility to withdraw officially from any class, which he or she ceases to attend. Failure to do so will result in the recording of an "F" grade. Students contemplating withdrawing from a course should read the section of the catalog entitled "Withdrawal and Course Changes."

. **Academic Integrity:** Upon admission to HCC all students sign a pledge to uphold an honor system which holds the qualities of honesty and integrity in the highest regard for the duration of their educational experience. The HCC Honor Code Policy and Procedures is published in the Student Handbook and may be obtained in the Student Activities Office. Become familiar with the Honor Code Policy and Procedures. **Honor Code violations may result in an F for the work involved, an F for the course, or permanent expulsion from HCC.**

Total Hours Of Coursework: To earn one academic credit at HCC, students are required to complete a minimum of 37.5 clock hours (45 fifty-minute academic hours) of coursework per semester. Those hours of coursework may be completed through a combination of hours within the classroom and hours outside the classroom. Certain courses may require more than the 37.5 minimum hours of coursework per credit.

For most classes, students should expect to do at least 2 hours of coursework outside of class for each hour of in-class coursework.

Credit Hour to Clock Hour Calculation:

Direct Faculty Instruction: 1 hour/week/credit for 15 weeks; 50 min = 1 classroom hour
(50 min x 4 credits x 15 weeks) = 3000 minutes = 50 hours

Student Work Outside the Classroom:
(2 hrs x 50 hours in class) = 100 hours

Total Time Needed: 150 hours

Activity	Hybrid	Lecture
Outside of the Classroom		
Online Instruction (videos)	30 hours	
Written Assignments	80 hours	80 hours
Test Preparation	20 hours	20 hours
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Subtotal	**130 hours**	**100 hours**
Inside of the Classroom	**25 hours**	**50 hours**
Total	**155 hours**	**150 hours**

NOTE: THE INSTRUCTOR RESERVES THE RIGHT TO MODIFY THE COURSE CONTENT AND/OR THE EVALUATION (TESTING) PROCEDURES AS DEEMED NECESSARY

CONTACT INFORMATION: (Provided under INSTRUCTOR information)

SERVICES FOR STUDENTS WITH DISABILITIES: Students may receive reasonable accommodations if they have a diagnosed disability and present appropriate documentation. Students seeking accommodations are required to contact the Disability Support Services (DSS) office as early as possible. Students may contact a DSS staff member for an appointment at dss@hagerstowncc.edu or at 240-500-2530.